Peer Support to Facilitate Knowledge Sharing on Complex Tasks

Summary

A Learning Network is a particular kind of online social network that is dedicated to learning in a particular domain (Sloep, 2009). In Learning Networks, it is expected that learners become active, self-directed learners, and eager knowledge-sharers to solve questions, give advice, participate in discussions, etc. However, while knowledge sharing is an important learning activity in Learning Networks, most of the current Learning Networks are ill-equipped with the infrastructure that guides self-organized knowledge sharing (Koper, 2009). This research contributes to answering the question of how to design such an infrastructure.

Earlier, our research team used a software based peer support system to facilitate knowledge sharing on *content-related questions*. In this study, we wished to find out how to further improve the design of this peer support system, especially to facilitate knowledge sharing on *complex tasks.* Since little pedagogical theory is available on Learning Networks specifically, this research attempted to apply three guidelines to the design of our peer support system; they are derived from cognitive load theory (Sweller et al., 1998; Van Merriënboer & Sweller, 2005) and inform instructional designs in classroom settings:

- The total load (defined as the sum of intrinsic, extraneous and germane load) of self-organized knowledge sharing should not exceed the limit of working memory capacities.
- Working memory capacities should be used as little as possible on extraneous non-learning activities.
- Working memory capacities should be used as much as possible on learning activities that are germane to learning itself.

In the introductory chapter (Chapter 1) we identified the interplay between the task complexity and extraneous non-learning activities for organizing knowledge sharing. Taking the perspective of cognitive load, we noted that, without a support infrastructure, allocating cognitive resources on these extraneous activities may easily result in ineffective learning on complex tasks. We proposed to use an existing peer support system to alleviate cognitive load imposed by both self-organized knowledge sharing activities and high cognitive demands imposed by complex tasks. Since this existing peer support system had thus far only been applied to answering content-based questions, our research first studied the effects of using the system on alleviating learners' cognitive load and promoting learning efficiency by taking task complexity into account. Subsequently, we wanted to find out how to redesign this peer support system by examining the effects of facilitating the social interaction process during knowledge sharing.

Chapter 2 (Study 1) investigated whether using the existing peer support system results in more effective knowledge sharing on complex tasks than users of a conventional forum or a control group of individual learners who did not receive support through a dedicated system. This quantitative study examined the effects of these three types of support on learning performance, experienced cognitive load and learning efficiency (a

combination of learning performance and cognitive load). The results showed that complex tasks indeed imposed higher cognitive load than simple tasks. However, we found results that were the *opposite* of our hypothesis: learners without any form of support worked most efficiently on complex tasks, that is, more efficiently than the groups who could use a forum or our peer support system. Upon closer analysis, we found that we cannot positively conclude that our peer support system fares worse in comparison to the forum or control group because of two findings: i) knowledge sharing did not occur more frequently for learners working on complex tasks than those working on simple tasks, and ii) the peer support system and forum were hardly used: only a negligible number of knowledge sharing requests were actually made and acted upon.

Chapter 3 (Study 2) aimed to find out the effects of using *self-study tutoring guides* to enhance peer tutors' content knowledge versus tutoring skills on helping tutees with complex tasks. Self-study tutoring guides meant to enhance tutors' content knowledge were compared to self-study tutoring guides meant to enhance tutors' tutoring skills. Tutors whose content knowledge was to be boosted received additional course materials whereas tutors whose tutoring skills were to be improved received interaction structures that apply both task-processing and pedagogical skills. We investigated which type of tutors can help tutees to write better essays, help them to work more efficiently and result in higher tutee evaluation of tutor help. The results showed that tutees helped by tutors with improved tutoring skills performed better and worked more efficiently on an essay task than those helped by tutors with improved content knowledge.

Chapter 4 (Study 3) examined effects of *training* peer tutors either in content knowledge or in tutoring skills; training was intended to allow them better to help tutees with complex tasks. In contrast with the second study reported in Chapter 3, training rather than self-study tutoring guides was used to enhance peer tutors' content knowledge and tutoring skills. To better gauge the effects of training on how tutors perform their instructional task, this experiment was conducted in the context of peer tutors formulating feedback on tutees' research questions. We investigated which type of tutors would formulate better feedback, would better motivate their tutees to revise research questions, and would result in better tutee research questions. The results showed that tutors trained in tutoring skills formulated better feedback than those trained in content knowledge. Also, tutees helped by tutors trained in tutoring skills were more motivated to revise their work than those helped by tutors trained in content knowledge. Remarkably, no difference was found in tutee performance on revised research questions.

In Chapter 5, first, we discussed some methodological limitations of implementing Study 1 in non-formal Learning Networks: i) we could not force learners to share knowledge with others, ii) we could not measure cognitive load timely and accurately, and iii) due to a high drop-out rate we could not generalize the data from the remaining users to the general population. As a consequence, we implemented Study 2 and 3 in more controlled school settings. Clearly, this negatively affected the ease of generalizing

our results to non-formal Learning Networks. Second, we pointed out the following aspects for future research. These are i) determining the level of cognitive overload when investigating the effects of interventions based on cognitive load theory, ii) examining the relationship between task complexity and types of tutor support, iii) examining the relationship between task complexity and different definitions of tutor characteristics, and iv) tutor learning effects. Finally, we indicated some instructional implications for the design of (informal) knowledge sharing in Learning Networks, collaborative learning and peer tutoring in classroom settings.